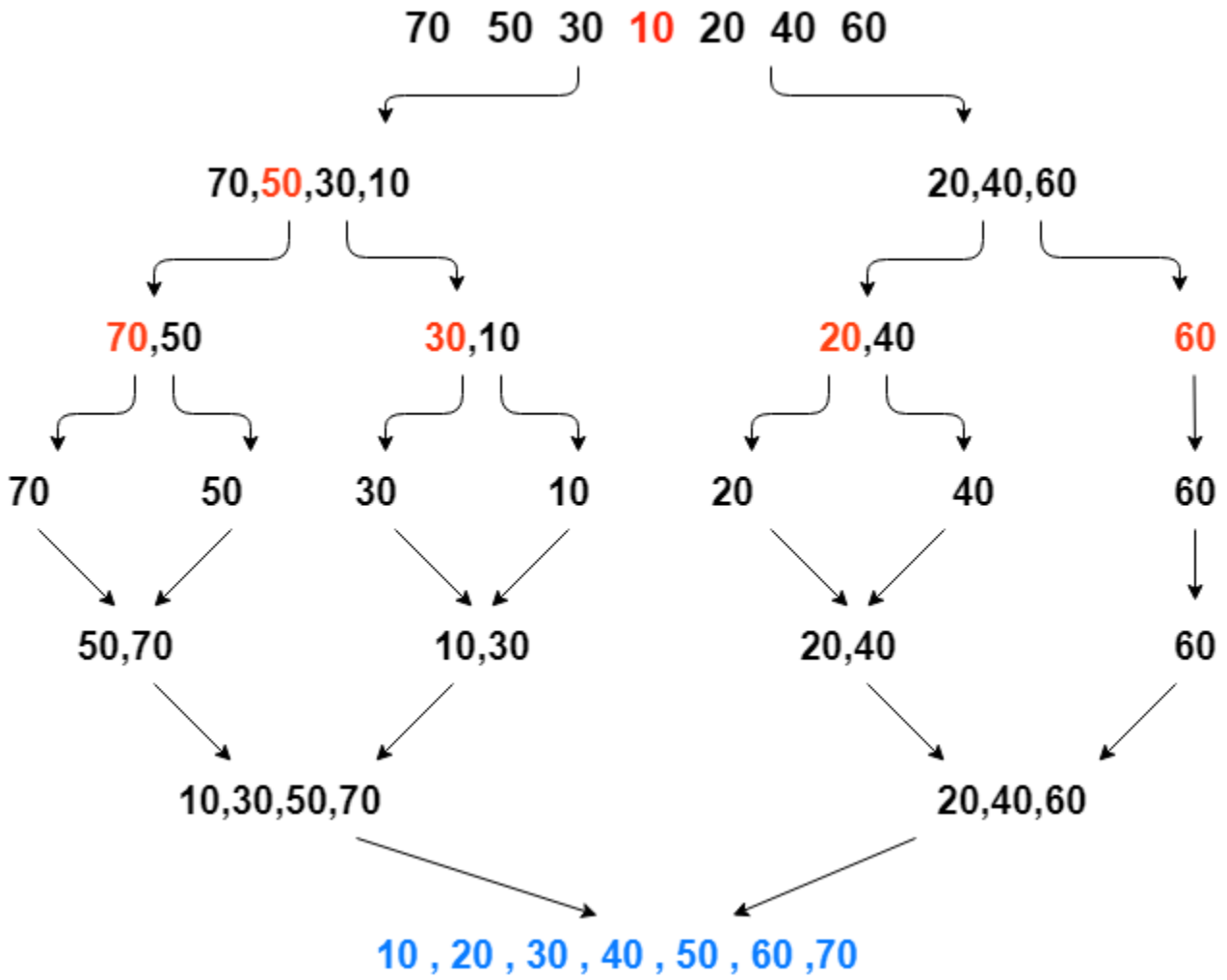
COEN-352 Tutorial #5

February 12th, 2023

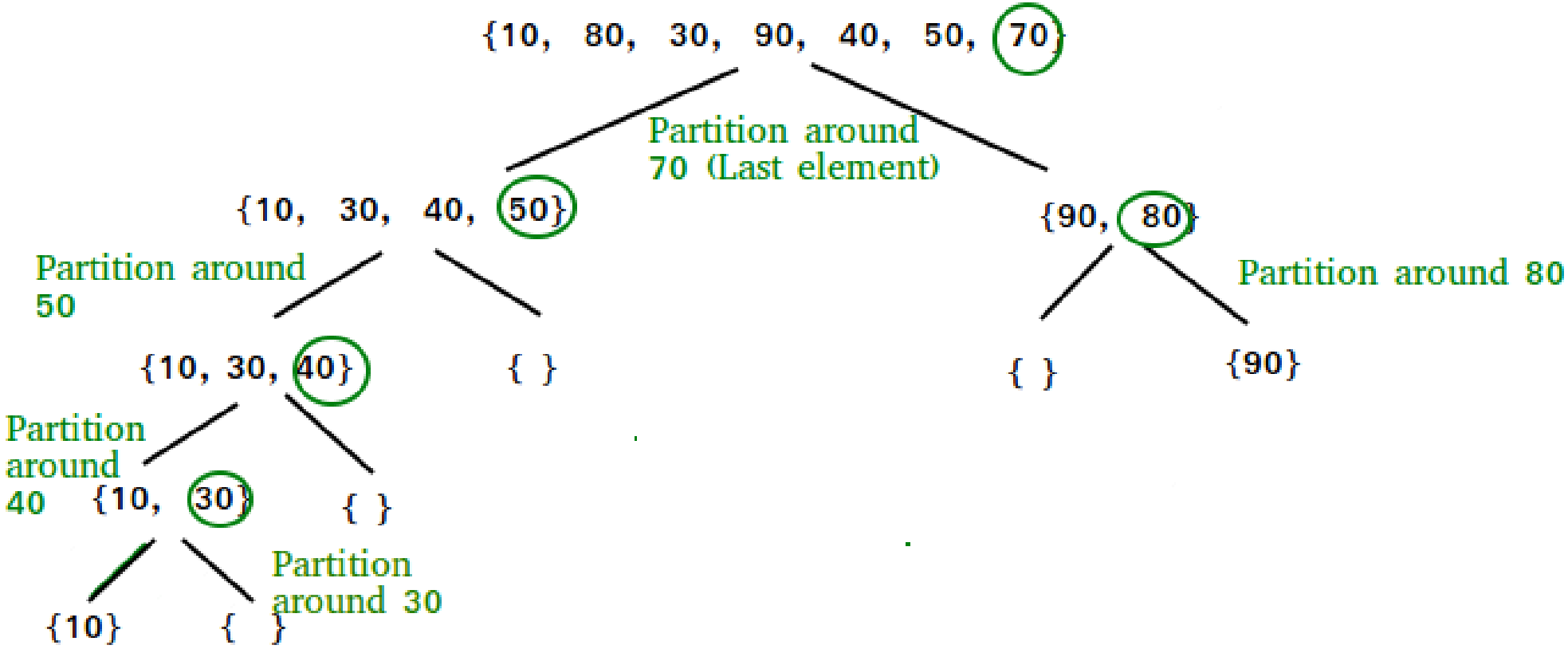
CASE: MergeSort (Look at the code)



- Unsorted Array
- Split into 2
- Spilt again
- Split for last time
- Merge based on order
- Merge again
- Final merge

Source: https://www.digitalocean.com/community/tutorials/merge-sort-algorithm-java-c-python

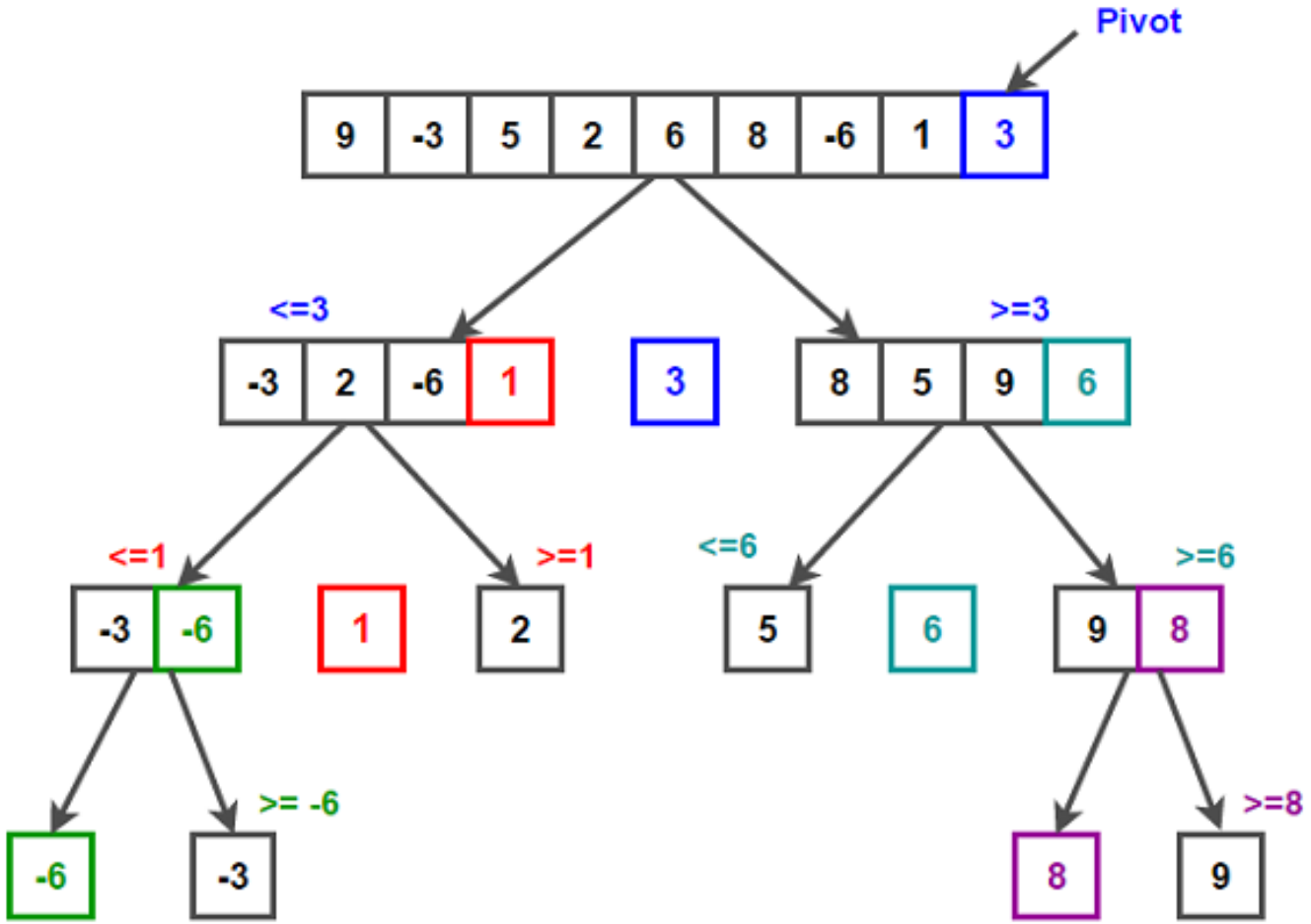
QuickSort: MergeSort's Sibling



-> **QUESTION:** Which methodology is used in Quick Sort? How is it achieved?

Source: https://www.geeksforgeeks.org/quick-sort/

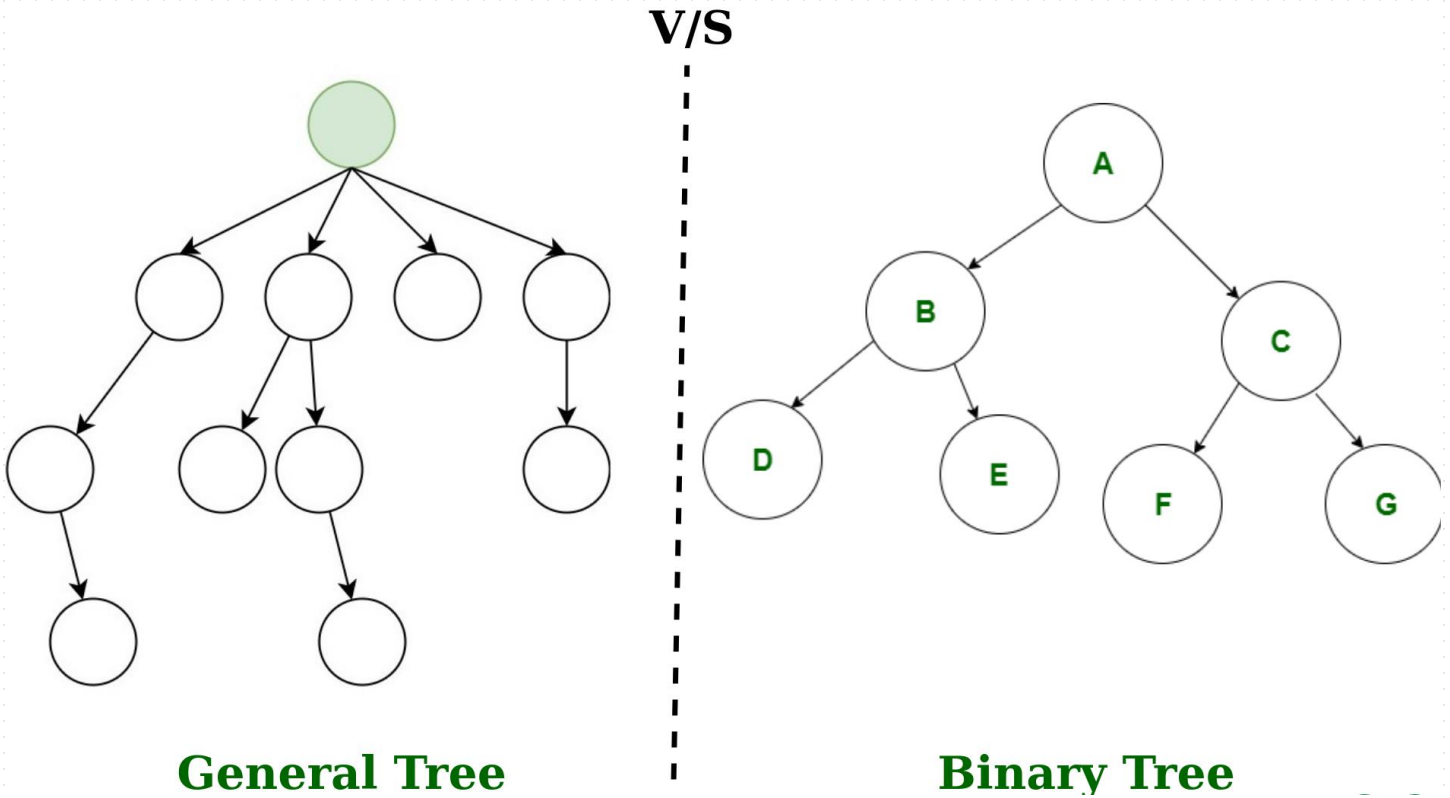
QuickSort: An alternative approach



Source: https://www.techiedelight.com/quicksort/

DS: Trees and Binary Tree

- **Tree** (General) data structure is **a hierarchical (non-linear)** data structure. It is a collection of nodes that are connected by edges and has a hierarchical relationship between the nodes.
- **Binary Tree**: Each node can have at most 2 child nodes.



Source: https://www.geeksforgeeks.org/difference-between-general-tree-and-binary-tree/

Heap Structure

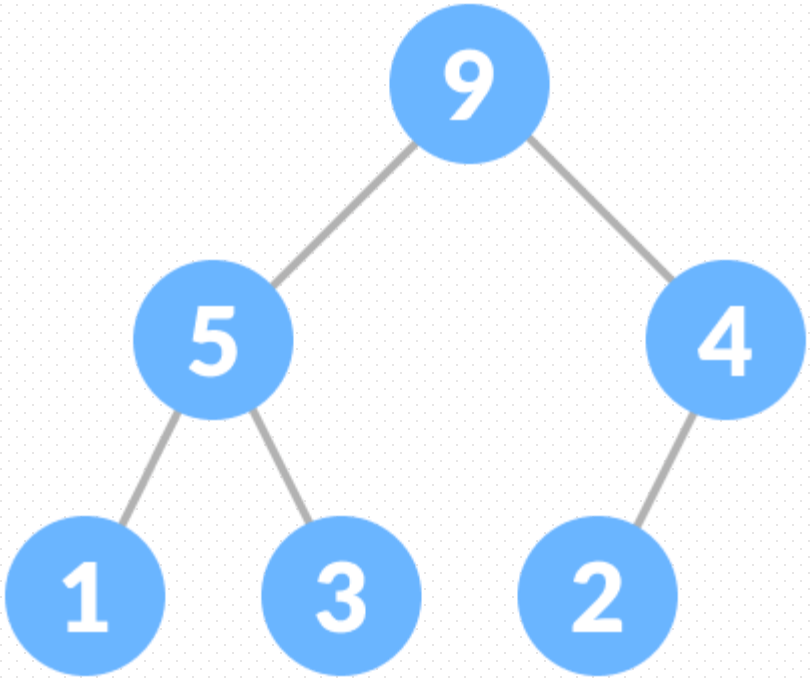
- A specialized complete binary tree where the parent is either smaller or bigger than its children.

It satisfies the heap property:

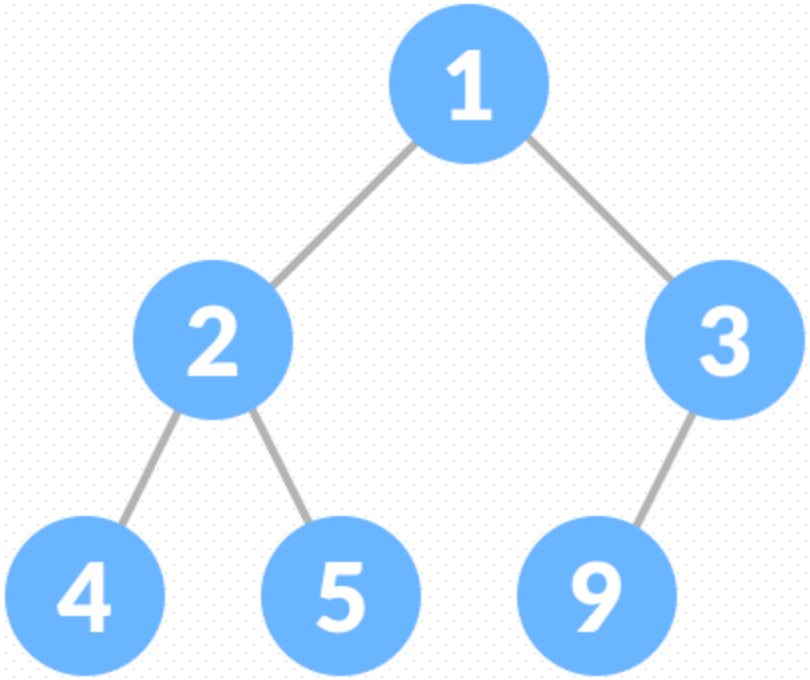
- Any given node is always greater than its child node/s and the key of the root node is the largest among all other nodes. This property is also called **max heap property**.
- Any given node is always smaller than the child node/s and the key of the root node is the smallest among all other nodes. This property is also called **min heap property**.

The Two Heaps

MAX HEAP

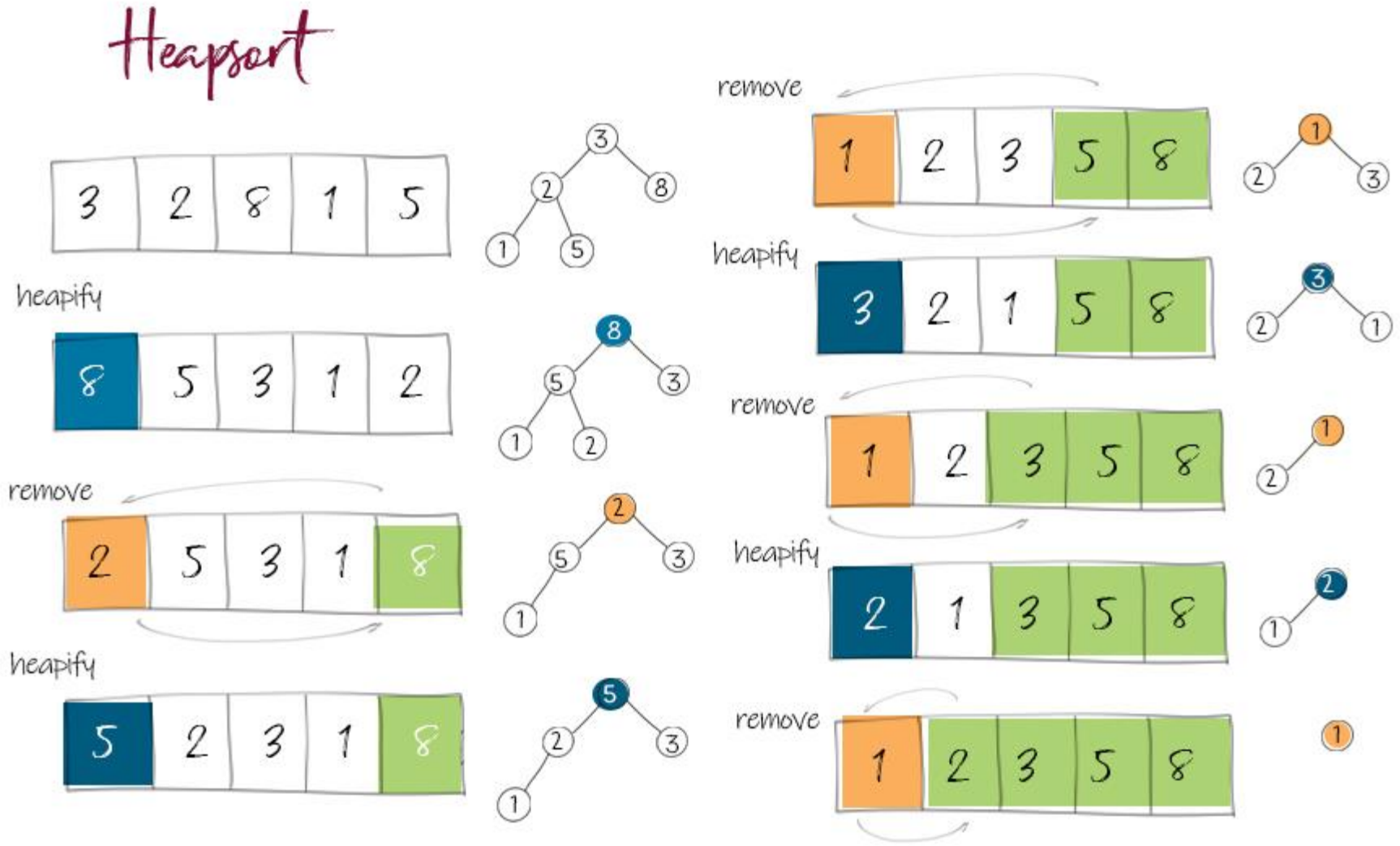


MIN HEAP



Source: https://www.programiz.com/dsa/heap-data-structure

HeapSort: A Different Story



Source: https://www.lavivienpost.net/heapsort-iteration-and-recursion/

Algorithms Comparison

Sorting Algorithms	Time Complexity			Space Complexity
	Best Case	Average Case	Worst Case	Worst Case
Bubble Sort	O(n^2)	O(n^2)	O(n^2)	O(1)
Selection Sort	O(n^2)	O(n^2)	O(n^2)	O(1)
Insertion Sort	O(n)	O(n^2)	O(n^2)	O(1)
Merge Sort	O(nlogn)	O(nlogn)	O(nlogn)	O(n)
Quick Sort	O(nlogn)	O(nlogn)	O(n^2)	O(n)
Heap Sort	O(nlogn)	O(nlogn)	O(nlogn)	O(1)

Source: https://www.enjoyalgorithms.com/blog/comparison-of-sorting-algorithms

THANK YOU